TRANSPORTATION COMMISSION

Bob Sanders
Commission Chair
trans@ci.moscow.id.us

Regular Meeting
~Agenda~

Bill Belknap
Staff Liaison
208.883.7011

https://www.ci.moscow.id.us/556/Transportation-Commission

Thursday
April 8, 2021

4:00 PM

Mayor's Conference Room
206 E. Third Street

NO QUORUM

WELCOME AND ATTENDANCE

REGULAR AGENDA

1. **Approval of March 11, 2021 Minutes (ACTION ITEM)**
   Presentation of minutes for approval.
   PROPOSED ACTIONS: Approve minutes as presented; approve minutes with amendments; or provide staff further direction.

2. **Public Comment**
   Members of the public may speak to the Commission regarding matters NOT on the agenda or currently pending before the Commission. Please state your name and city of residence for the record and limit your remarks to three (3) minutes.

3. **Commission Communications**

4. **Continued Discussion Regarding Sustainable Environment Commission's Climate Action Working Group Climate Change Impacts Assessment (ACTION ITEM) – Mary Dupree**
   The City of Moscow Sustainable Environment Commission's Climate Action Working Group (CAWG) presented their Climate Change Impacts Assessment for the City of Moscow at the Commission's March 11th meeting. The CAWG is seeking suggestions of the Transportation Commission as the city moves forward to formulate mitigation and adaptation strategies.
   PROPOSED ACTION: Receive report and provide recommendations as deemed appropriate.

5. **Edington Addition Preliminary Subdivision Plat Review and Recommendation (ACTION ITEM) – Bill Belknap**
   The City recently received an application for annexation and zoning of a 232-acre parcel of land and a preliminary subdivision plat for the 27-acre initial phase of the development. Staff will provide an overview of the proposal for the Commission's review and recommendation.
   PROPOSED ACTION: Receive report and provide recommendations as deemed appropriate.

6. **Harvest Hills Second Addition Preliminary Subdivision Plat Review and Recommendation (ACTION ITEM) – Bill Belknap**
   The City recently received an application for a preliminary subdivision plat for the Harvest Hills Second Addition. Staff will provide an overview of the proposal for the Commission's review and recommendation.
   PROPOSED ACTION: Receive report and provide recommendations as deemed appropriate.

7. **Replat of Lot 1, Block 1 of the Harvest Hills Addition Preliminary Subdivision Plat Review and Recommendation (ACTION ITEM) – Bill Belknap**
   The City recently received an application for the replat of Lot 1, Block preliminary subdivision plat for the Harvest Hills Second Addition. Staff will provide an overview of the proposal for the Commission's review and recommendation.
   PROPOSED ACTION: Receive report and provide recommendations as deemed appropriate.

UPCOMING EVENTS/MEETINGS

The next scheduled meeting is May 13, 2021.

ADJOURN

NOTICE: Moscow City Council Commission meetings can be televised, videotaped and/or recorded. Individuals attending the meeting who require special assistance to accommodate physical, hearing, or other impairments, please contact the City Clerk, at (208) 883-7015 or TDD 883-7019, as soon as possible so that arrangements may be made.

TRANSPORTATION COMMISSION

Robert Sanders
Commission Chair
trans@ci.moscow.id.us

Regular Meeting
~Minutes~

Bill Belknap
Staff Liaison
208.883.7011

https://www.ci.moscow.id.us/556/Transportation-Commission

Thursday March 11, 2021	**4:00 PM**	**Council Chambers 206 E. 3rd St.**

The meeting was called to order at 3:58 PM

MEMBERS PRESENT:	Bob Sanders, Chair; Erin Bacon (virtual), Randy Baukol (virtual), Mary DuPree (virtual), Joel Hamilton (virtual)
MEMBERS ABSENT:	Ben Calabretta, Brian Johnson, Mike McGahan
OTHERS:	Jeffrey Hicke (virtual), Tina Hilding (virtual), Anne Zabala (virtual), Janet Zarate (virtual)
STAFF:	Bill Belknap, Jennifer Fleischman

REGULAR AGENDA

1. **Approval of Minutes from January 14, 2021 (ACTION ITEM)**
   Presentation of minutes for approval.

DuPree moved for approval of the minutes as written, seconded by Hamilton. Vote by Acclamation: Ayes: Unanimous (5). Nays: None. Abstentions: None. Motion carried.

2. **Public Comment**
   Members of the public may speak to the Commission regarding matters NOT on the agenda or currently pending before the Commission. Please state your name and city of residence for the record and limit your remarks to three (3) minutes.

None.

3. **Commission Communications**

Belknap went over some City updates for the Commission; covering the Mountain View Project at 6th and Joseph, Sixth Street Bridge replacement, and D and Main Street turn signal modification projects. He also spoke about the LHSIP projects for Third and Sixth Streets, North Jackson Parking Lot Reconstruction project, and the Paradise Pathway Lighting and Reconstruction projects.

4. **Sustainable Environment Commission's Climate Action Working Group Climate Change Impacts Assessment (ACTION ITEM) – Mary DuPree**
   The City of Moscow Sustainable Environment Commission's Climate Action Working Group (CAWG) has prepared a Climate Change Impacts Assessment for the City of Moscow. The CAWG would like to present this information to the members of the Transportation Commission and discuss its findings and gather the suggestions of the Transportation Commission as the city moves forward to formulate mitigation and adaptation strategies.

DuPree introduced two co-workers from the Sustainable Environment Commission's Climate Action Working Group (CAWG): Jeffrey Hicke and Tina Hilding. Hicke followed the introductions with a presentation on the Climate Change Impacts Assessment for the City of Moscow, as described above, and then Hilding expanded on the collected data and reviewed the purpose of CAWG. She presented sample plans from two different cities to possibly model transportation plans from. Hilding requested input from the Commission of any information or suggestions that could possibly be pertinent or helpful for the Working Group moving forward.

The Commissioners discussed traffic, transportation means and the impact therein, around schools, and a public transit system between Pullman and Moscow. CAWG and the Commission asked Staff about the City moving from gasoline and diesel to primarily electric fleet vehicles. Belknap explained that the police and city fleets are currently transitioning to hybrid electric vehicles. Installing public charging stations for electric vehicles is being discussed by the City.

The Commissioners will consider the request for more information and ideas and send a response back to CAWG after the next meeting in April.

5. Continued Discussion Regarding E-Bike and E-Scooter Policy Development (ACTION ITEM) – Bill Belknap

Last winter, the Commission conducted a review of the relevant State of Idaho and City statutes and regulations pertaining to electric assist bicycle and electric scooters in light of the recent increase in use of these devices within the community. The Commission developed general framework for the use of E-Scooters which is currently under development and review by the City Attorney's office. The City recently received requests from two vendors to deploy E-Scooters within Moscow and Staff will provide a report and update to the Commission.

Belknap reviewed the background of the policy development, as provided above, after explaining that both Lime and Bird have recently requested to operate in Moscow. Moscow Police Department was included in the development of the policy, but wasn't concerned with regulating e-scooters based on speed, but would enforce it if it became a hazardous problem. The City Attorney is working on drafting a set of standards regarding the operation and policies surrounding e-scooters, as well as a license agreement between the two ride-share programs and the City. Belknap presented some guidelines compiled by National Association of City Transportation Officials (NACTO) that will impact the license agreement between a shared micro-mobility company and the City of Moscow. Commissioners expressed gratitude for Staff's work on the policy development and license agreement and had no other comments.

6. Neighborhood Traffic Calming Device Policy Development (ACTION ITEM) – Bill Belknap

Over the last year staff have received multiple requests for the installation of traffic calming devices in different locations within the community which has led staff to identify the need to develop a standardized process and approach to addressing traffic calming device requests. Staff has completed preliminary research on the topic and wanted to begin the discussion on the topic with the Commission.

Item was postponed until the next scheduled meeting.

UPCOMING EVENTS / MEETINGS

The next regular meeting is scheduled for April 8, 2021.

The meeting adjourned at 5:40 PM

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Robert Sanders, Chair

Goals of Moscow Climate Action Working Group

Whereas: Climate change is an imminent threat to all communities and rural communities in particular (IPCC 2014).

Whereas: Moscow, in particular, faces clear threats regarding wildfire, air quality, and vector borne disease (U.S. Global Research Program 2020).

Whereas: Citizens look to the city government to help in the absence of state and federal recognition of the dangers of the climate crisis.

We aim to:

1. Research the potential impact of climate change on Moscow and Latah County through conducting a vulnerability assessment.
2. Research the positive, neutral and negative economic, social, and environmental potentials of different actions Moscow could take to mitigate climate change.
3. Research the positive, neutral and negative economic, social, and environmental potentials of different actions Moscow could take to adapt to a changing climate.
4. Gather public input in regard to mitigation and adaptation actions
5. Develop a climate action plan incorporating research and public input

References:

Intergovernmental Panel on Climate Change (IPCC) Report. 2014.
https://www.ipcc.ch/report/ar5/wg2/

U.S. Global Research Program 2020.
https://nca2014.globalchange.gov/highlights/regions/northwest#menu-report

Climate Change Impacts Assessment for Moscow, Idaho

June 16, 2020

"The consequences of a changing climate, including drought, higher temperatures, altered precipitation patterns, increased forest fires, more plant and animal pests and disease, and increased air pollution, have the potential to increasingly impact all Moscow residents."

City of Moscow Resolution, 2018

Climate Change Assessment Team

Report Authors

Dr. Jeffrey Hicke, Professor, Department of Geography, University of Idaho

Dr. Michael Jennings, United States Forest Service, retired

Dr. Kristin Haltinner, Professor, Department of Sociology, University of Idaho, Sustainable Environment Commission

Scientific Experts

Dr. Jeffrey Hicke, Professor, Department of Geography, University of Idaho

Dr. Michael Jennings, United States Forest Service, retired

Climate Action Working Group Members

Ilan Carter, Moscow Sustainable Environment Commission; Moscow High School Environmental Club

Robbie Cooper, Moscow Parks and Recreation Commission

Mary DuPree, Moscow Transportation Commission; Citizens Climate Lobby

Cassandra Goodmansen, Moscow Sustainable Environment Commission

Jonathan Gradin, Moscow Pathways Commission

Kristin Haltinner, Moscow Sustainable Environment Commission

Tina Hilding, Moscow Sustainable Environment Commission

Russ Moore, Moscow Sustainable Environment Commission

Al Poplawsky, Sierra Club

Elizabeth Stevens, Moscow Human Rights Commission

Amber Ziegler, Moscow Sustainable Environment Commission

Photo courtesy of City of Moscow

"Eleven Years"

A poem by Young Brown Clevenger, Age 12, Moscow Middle School

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11 years.

That's what the United Nations stated in March 2019.

11 YEARS at this rate until climate change is irreversible. Our lives wasted in 11 years.

In 11 years, I will be 23. 23!

And that was last year. Last year was the warning, by this point we have 10 years.

These ten years will go by in a snap, and if we don't do anything about it, we are screwed.

And this is your fault. My fault. OUR fault.

But these are not going to be our last moments, our last memories. WE CAN CHANGE THIS, together.

Together, we can save the polar bears, the tigers, the elephants.

Together we can save those in poverty and sickness. We can save this Earth, OUR Earth.

Because, without this Earth, without each other, where would we be?

Because we need time and time needs us to heal. To fix the mistakes we made so we can live and die, knowing we did right.

We have 10 years to fix what we've done. Not 10 years to live. 10 year to fix our mistakes.

Executive Summary

Climate change is happening now and is expected to continue into the future. Understanding the magnitude of climate change and how it impacts Moscow and the surrounding landscapes is critical for justifying actions that will reduce greenhouse gas emissions ("mitigation") and minimize any negative effects ("adaptation"). This Climate Change Impacts Assessment of the Palouse Region reports on a) the extent that the climate has changed over the past several decades, b) the changes expected in the future, and c) the effects climate change has had and will have on the people and ecosystems of the Palouse Region.

Air temperatures have increased in Moscow over the last 100 years, and depending on future societal choices about greenhouse gas emissions, it is projected to continue increasing for decades to come. Warming will occur in all seasons, and heatwaves are expected to increase in severity and frequency. Precipitation has increased slightly since 1950; projections indicate that future annual precipitation will increase, but that summer precipitation will decrease. As a result of warming, precipitation will shift toward more rain and less snow, and snowpack will decline and melt earlier. The reduced snow season will mean longer, drier summers, with resulting increases in fire season length and more fires and reduced summer streamflow that will affect aquatic ecosystems and water quantity and quality for human uses. Human health will be affected through additional smoke from more wildfires, increased heat-related morbidity and mortality, more pollen and ozone pollution, and expansion of vectors of disease. Agriculture will be affected both positively (through carbon dioxide fertilization and longer growing seasons) and negatively (through reduced summer soil moisture and increased pest outbreaks). Some forests at higher elevations in northern Idaho could benefit from longer growing seasons, and lower-elevation forests may decline because of additional moisture stress.

The impacts described in this assessment will provide input to the next step, a Climate Action Plan, that will be undertaken to identify specific areas and sectors of the Moscow region that will be susceptible to climate change and outline a plan to adapt to and mitigate the impacts of climate change.

Data Used in this Report

Historical Data

Statements about historical (the last 100-150 years) climate change are best made with the longest, most reliable observations possible. In the United States, those are from the Historical Climatology Network (HCN), a set of high-quality stations with long-term records and minimal gaps. Temperature and precipitation (rain plus snow) have been recorded since about 1900 (varies by station). Although the HCN stations are somewhat sparsely distributed geographically, the HCN station nearest to Moscow is located at the University of Idaho.

Projection Data

Climate projections are produced by running a climate model with a prescribed "scenario" of greenhouse gas emissions (see box at right). Climate model outputs are analyzed for different periods in the future, typically near-term (next decade), mid-century, and end-of-century. Because of variability in climate model complexity, projections from multiple models are often presented, with the average among models often assumed to be most representative.

Impact Data

The information in this report is drawn from the peer-reviewed scientific literature and summaries, syntheses, and reviews of climate change in local, national, and international assessment reports (see end of document). Idaho examples are provided where available; some findings may be based on regional (US Northwest) studies of impacts; in cases where local or regional studies are not available, information is based on the best scientific understanding of climate influences.

How climate models work

A variety of inputs to climate models is included when making projections about future climate change. The most difficult input to determine is any change in human behavior that may affect the emissions of greenhouse gases. Therefore, scientists have developed different scenarios for use that are not predictions but rather possible future pathways. These scenarios span the range from low emissions in the future that minimize future climate change (such as "RCP4.5") to moderate emissions scenarios to high emissions scenarios (such as "RCP8.5") that project continued emissions growth and a higher amount of climate change. Different emissions scenarios (e.g., low versus high) associated with different possible societal choices, population growth, and socioeconomics result in different amounts of climate change and illustrate the effects of reducing emissions. Recent greenhouse gas emissions have been most similar to the RCP8.5 scenario.

For more information see:
"Climate Models" by NOAA
https://www.climate.gov/maps-data/primer/climate-models
"Evaluation of Climate Models" by IPCC
https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5_Chapter09_FINAL.pdf

University of Idaho Arboretum by Kristin Haltinner, 2014

Climate Change Impacts in the Palouse Region

Temperature Changes

Since 1900 annual average temperatures have increased 1-1.5 ºF. They are expected to increase another 6-12 ºF by 2099.

Recent climate change has been caused in large part by increasing greenhouse gases in the earth's atmosphere, which trap more heat than would otherwise escape to space, causing the earth to warm[1]. The amount of climate change is not the same across the earth due to variability in land features and air and water circulation patterns[1]. This section looks at the historical and projected temperature changes for Moscow, Idaho, and the region.

Climate station records indicate that temperatures in our region have already increased. From 1900 to 2018, the average annual temperature increased by 1-1.5 ºF[2]. Due to the impacts of other environmental factors–such as snowpack and water–the increase in average temperature is not evenly distributed over the year. Rather, the increase in warming has been slightly greater in the winter than in the summer: the coldest temperature of the year has increased by 2-5 ºF[3] while the warmest temperature of the year did not change significantly.

Climate model projections using higher emissions scenarios (RCP8.5) suggest that Moscow will continue warming by another 6-12 ºF through 2070-2099[4,5] (Figures 2 and 3). In the Northwest region, warming of 3.7 ºF (lower emissions scenario, RCP4.5) to 4.7 ºF (higher emissions scenario, RCP8.5) is projected by mid-century, with warming of 5-8.5 ºF by late century[3].

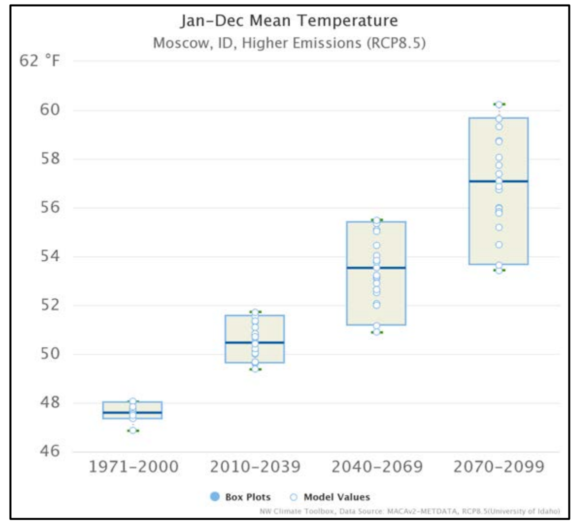


Figure 2. Projected average annual temperature for Moscow, ID, using the higher emissions scenario (RCP8.5). For each time period, dots indicate different climate model results, the black line indicates the median temperature, and the green box indicates the 25-75 percentile range of models.

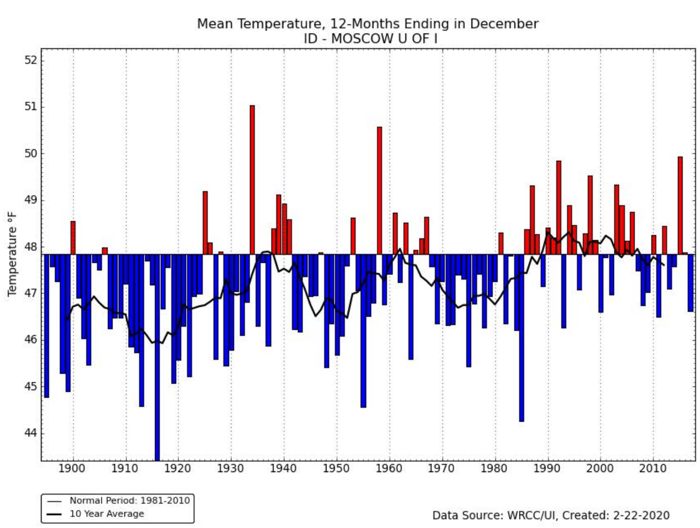


Figure 1. Observed average annual temperature for Moscow, ID, recorded by the Moscow HCN climate station. Blue bars are below the average temperature, red bars are above.

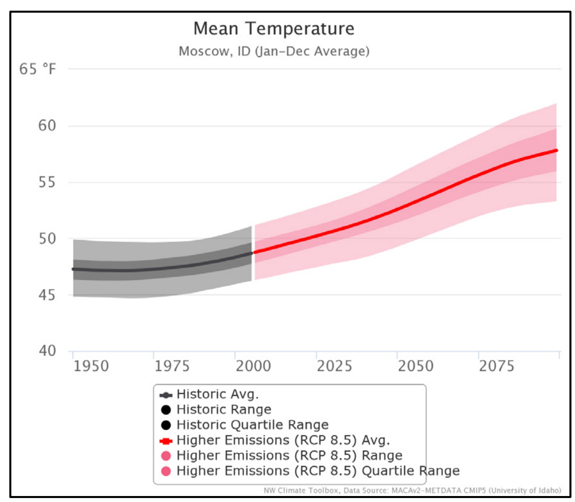


Figure 3. Projected average annual temperature for Moscow, ID, using the higher emissions scenario (RCP8.5). Black lines indicate model results for historical period, red lines indicate model projections into the future; bands indicate range of results from different climate models.

Summer Temperatures

Summer maximum temperatures are expected to increase by 12 ºF.

Summer temperatures in Moscow are projected to increase significantly. Currently summer high temperatures average around 80 ºF (Figure 4)[4]. Considering all climate model results, summer temperatures are projected to increase to 92 ºF by the last decades of the century. Regional trends are similar: the warmest day is projected to increase by 6 ºF by mid-century. Heat waves will also become more intense: the temperature of the most extreme (1-in-10 year) heat waves (5-day warm conditions) is expected to increase by 12 ºF[4]. The number of days with a heat index (a measure of "apparent temperature" that combines temperature and relative humidity) above 90 ºF is projected to increase from fewer than 10 today to more than 50 by 2070-2099 (Figure 4). Extremely hot days (temperatures above 100 ºF or 105 ºF) are also expected to increase. These conditions are rare today but are projected to occur frequently by the end of this century (Figure 4)[4].

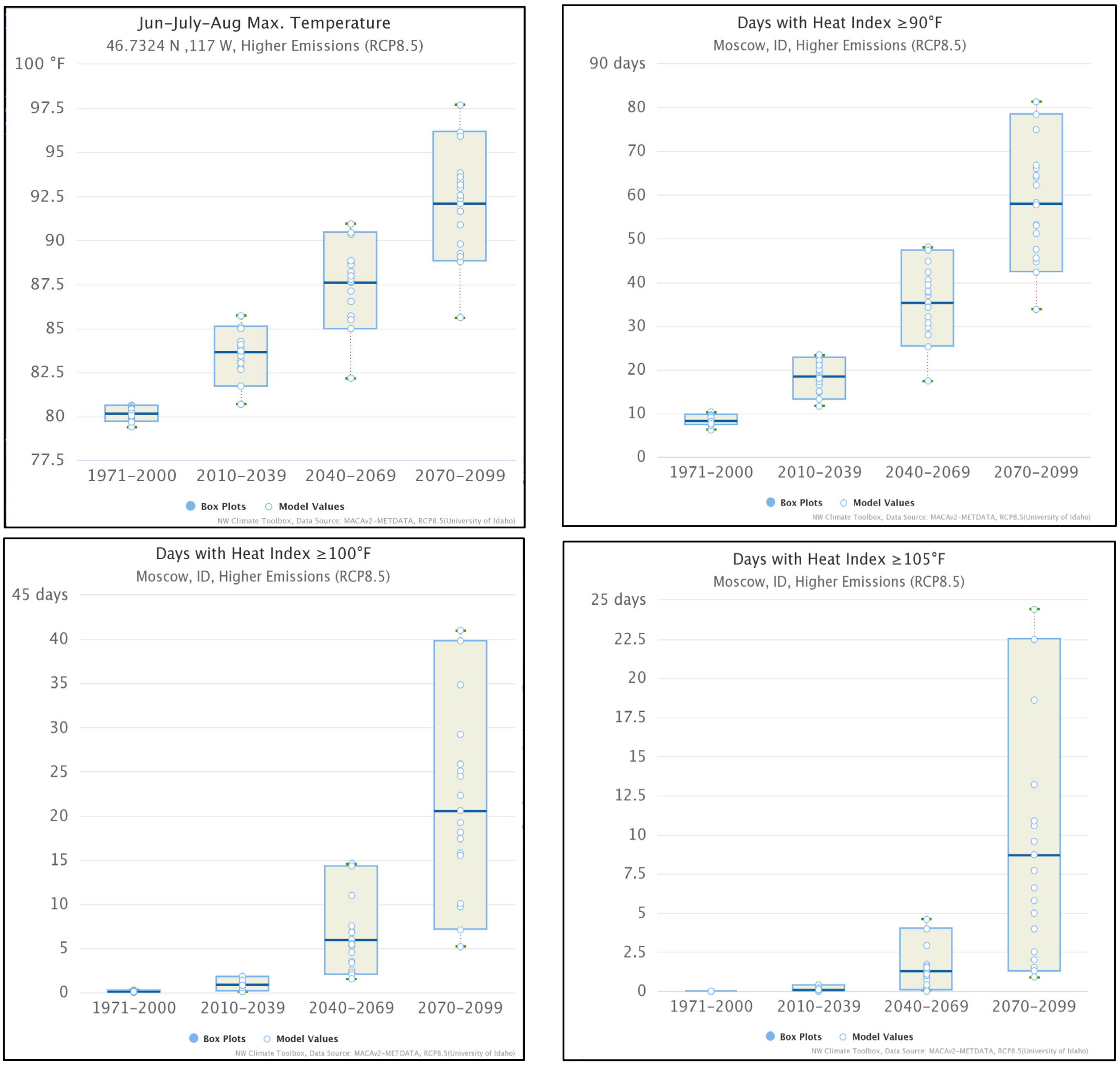


Figure 4. Projected summer temperatures (upper left) and heat indices (upper right, lower left, lower right) for Moscow, ID, using the higher emissions scenario (RCP8.5). See Figure 2 for more details about box plots.

Winter Temperatures

Winter temperatures are expected to rise from below freezing to 41 ºF. The annual number of days above freezing will increase from 240 to 330 by 2100.

Winter temperatures in Moscow are also projected to increase. Average winter (December-January-February) temperature is projected to increase from below freezing to 41 ºF by late century (Figure 5)[4]. This change is particularly significant as it will influence whether precipitation falls as snow or rain and will impact the amount and duration of snow cover. The number of days with minimum temperature above freezing will increase from a current average of 240 to 330 by the end of the century (Figure 6). The temperature of the coldest day of the year for the Northwest is projected to increase by 7 ºF by mid-century, and the temperature of extreme cold snaps (5-day temperatures for 1-in-10 year events) is expected to increase by 11 ºF[3].

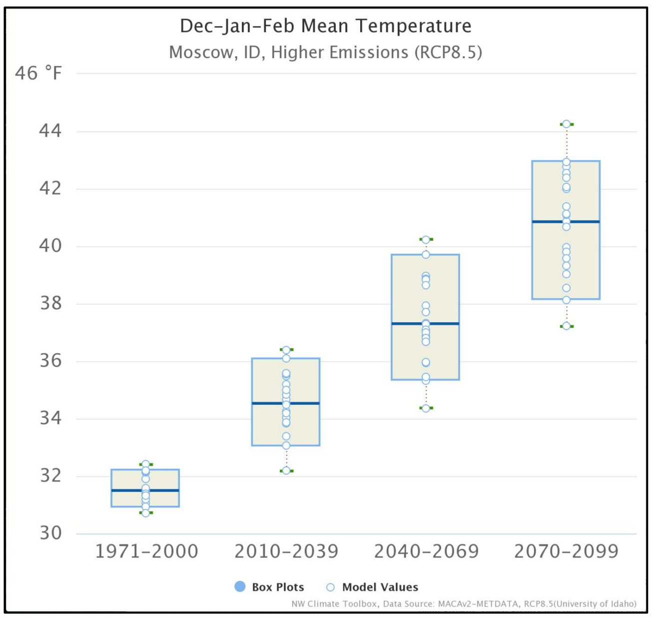


Figure 5. Projected winter (December-January-February) temperature for Moscow, ID, using the higher emissions scenario (RCP8.5). See Figure 2 for more details about box plots.

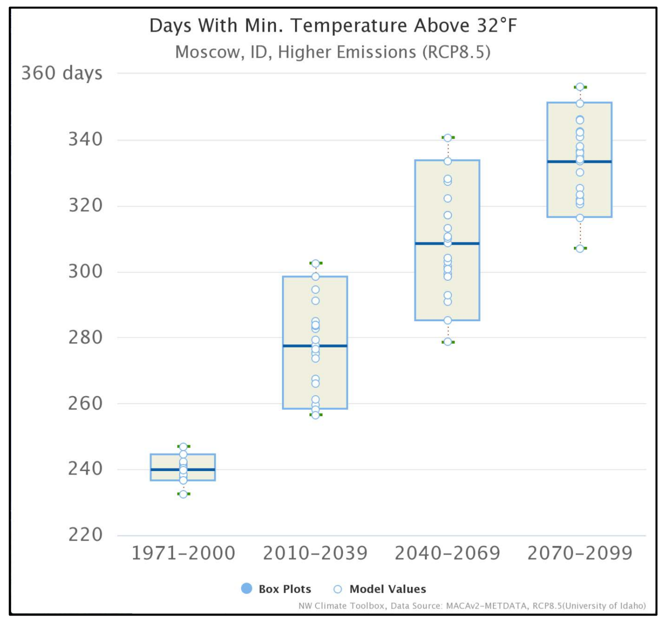


Figure 6. Projected number of days with minimum temperature above freezing (32 ºF) for Moscow, ID, using the higher emissions scenario (RCP8.5). See Figure 2 for more details about box plots.

Precipitation Changes and Water Impacts

In addition to changes in temperature, climate change will also alter precipitation patterns[1].

Northern Idaho has experienced slightly higher annual precipitation in the last 100 years, with decreases in fall and winter precipitation and increases in spring and summer precipitation (Figure 7). Since 1900, total annual precipitation has increased slightly, with most of the increase occurring in the last 50 years (Figure 8)[2]. Between 1900 and 2018, summer precipitation–important for plant growth–has varied greatly and demonstrated little long-term trend (Figure 9). In the Northwest region, extreme precipitation events have increased somewhat in frequency in the 20th century, although the total amount of extreme precipitation has not varied significantly[3].

The intensity of precipitation is projected to increase throughout the region.

Climate models project that annual precipitation for Moscow will increase overall. Model results from both high and low emissions scenarios project an increase from 27" of annual precipitation in recent years to between 28 and 29" by late century (Figure 10)[4]. The largest increases are expected to occur in winter and spring, and summer precipitation is projected to decrease by 0.5" (14%), from 3.7" to 3.2" (Figure 11).

The intensity of precipitation is projected to increase across the Northwest region. The amount of precipitation during extreme events is expected to increase by 9-19%, depending on time period and emissions scenario. Model results using the highest emissions scenario project an increase in the frequency of extreme precipitation events by a factor of 2-3[3]. Extreme precipitation events can lead to flooding and soil erosion[6].

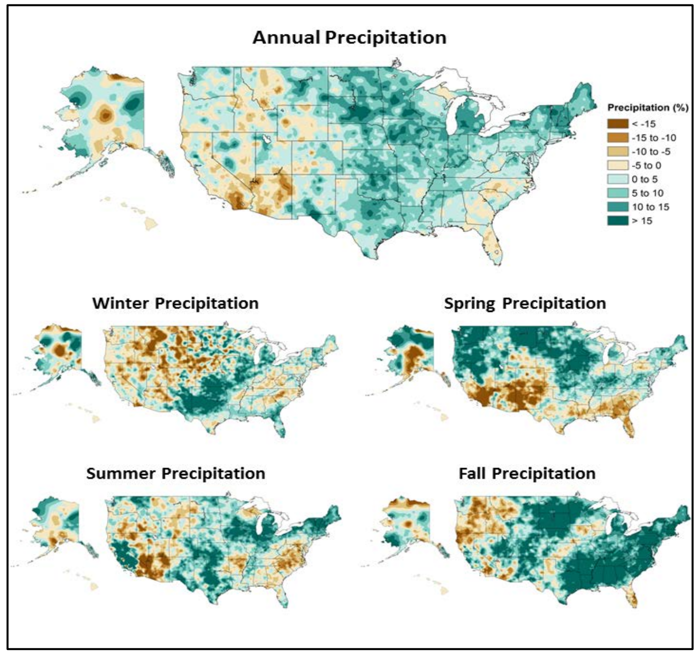


Figure 7. Annual and seasonal changes (1986-2015 average minus 1901-1960 average divided by 1901-1960 average) in precipitation. From USGCRP, 2017.

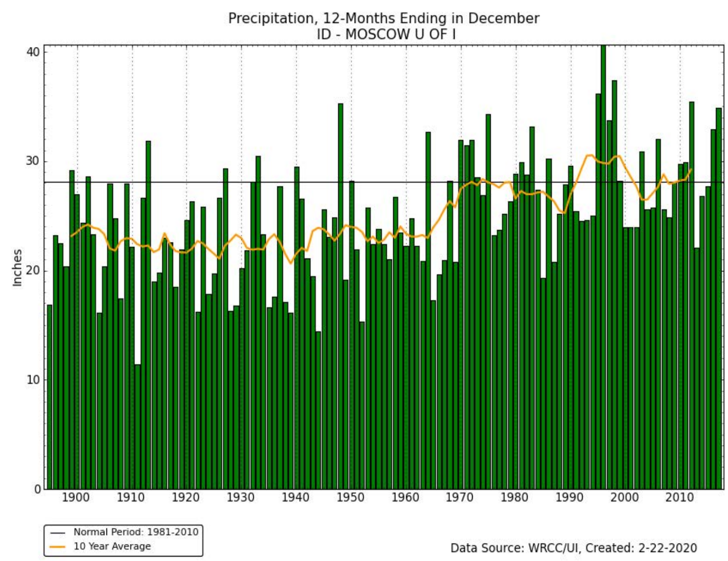


Figure 8. Observed annual precipitation for Moscow, ID, recorded by the HCN climate station. Horizontal black line indicates average during 1981-2010; orange line indicates running 10-year average.

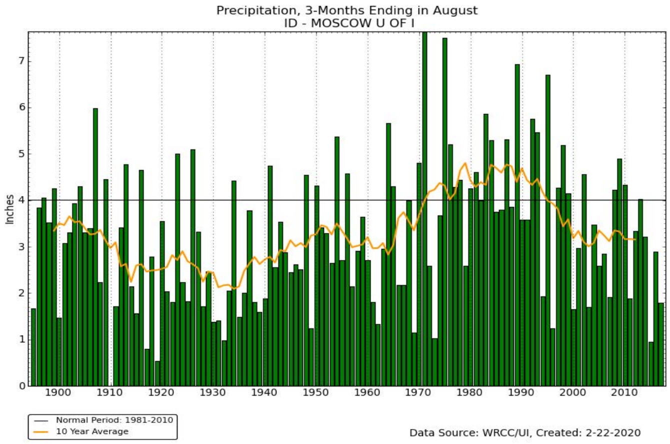


Figure 9. *Observed summer (June-July-August) precipitation for Moscow, ID, recorded by the HCN climate station. Horizontal black line indicates average during 1981-2010; orange line indicates running 10-year average.*

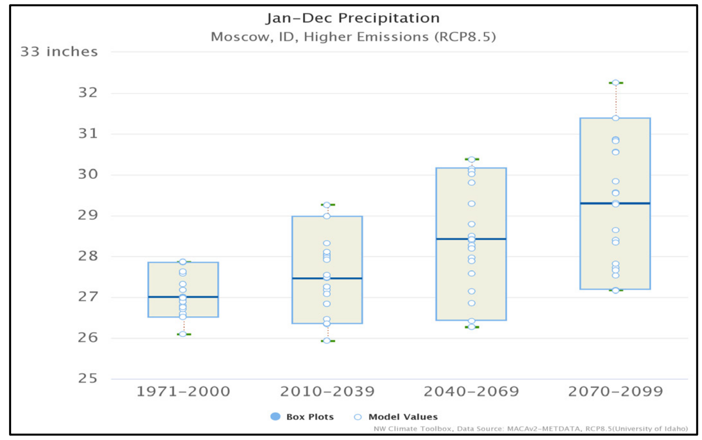


Figure 10. *Projected annual precipitation for Moscow, ID, using the higher emissions scenario (RCP8.5). See Figure 2 for more details about box plots.*

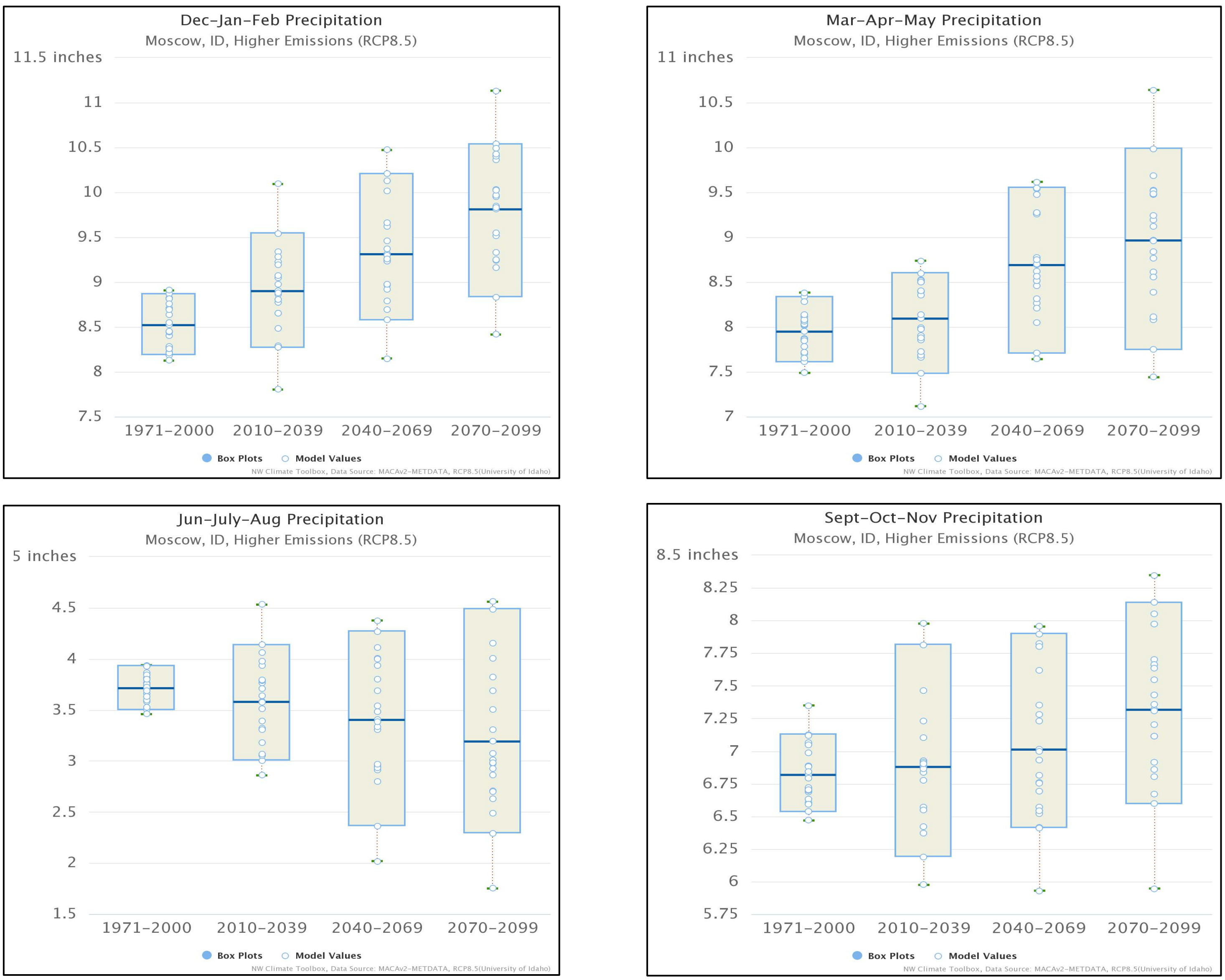


Figure 11. *Projected precipitation for winter, spring, summer, and fall for Moscow, ID, using the higher emissions scenario (RCP8.5). See Figure 2 for more details about box plots.*

Local Experiences with 2019 Flooding

by Al Poplawsky

I have lived in Moscow since 1988 and during that period have observed major flooding several times, with the worst occurring in 1996 - until last year.

These previous floods were classic “rain on snow” events which occurred when a “pineapple express” (warm rainstorm) came roaring into the region in the late winter with lots of snow on the ground. These events are very predictable and are generally forecast by the National Weather Service (NWS) several days in advance.

From 1988 until 2019 I had never heard of a flash flood in our region and I thought of these more in terms of the Southwest of our country. However, in 2019, we experienced the effects of two flash floods locally. The first, in April 2019, occurred with no snow on the ground.

I walked at mid-afternoon in the driving rain from the UI Ag Science building a few blocks to the Sixth Street Greenhouse and noticed torrents of water running in the street gutters into the storm sewers. I was a bit confused. I am a weather nut and had just checked the NWS website which predicted showers but nothing major, and there were no warnings up.

After spending an hour at the greenhouse, I came out the door to return to the Ag Science building and was amazed by what I found. The pavement on Sixth Street and Stadium Way from the intersection to 20-30 yards in all directions was completely underwater! The storm sewers had been overwhelmed in a very short period of time. The NWS now had flood warnings up on their website.

When I rode my bike home an hour later water was up to the axles at the intersection of Sixth and Washington in downtown Moscow. There was also major flooding in north Moscow near North Main and D Streets, and east of Mountain View on D Street. In the latter location, several residents suffered major losses because they had no warning and thus no time to move their belongings to higher ground. In Pullman, Grand Avenue turned into Grand River.

There was a second, smaller flash flood just east of Moscow less than a month later, which deposited large quantities of mud on the Latah Trail. Neither of these floods had been predicted by the NWS because they were caused by unpredictable, intense rain events. These were the first such events I had ever experienced during 30 years in Moscow.

Flooding in Moscow by Randy Stuart, 2019

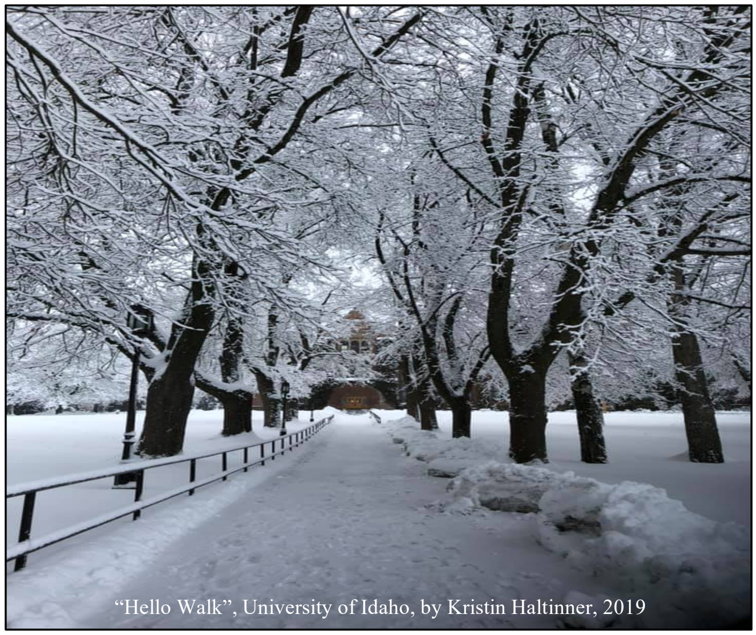
After the Storm by David Harlan, 2020

Snowpack

During the latter part of the 20th century, warming caused declines in snowpack and earlier snowpack melt across the western United States[7]. Moscow, Idaho shows similar trends: snow water equivalent (a measure of snowpack) at Idaho sites near Moscow decreased by 40-80% between 1955 and 2016[7].

In recent decades, as melting has occurred earlier, Idaho streamflow peaks associated with snowmelt have also come earlier. The volume of water has also been reduced[8,9]. Historically, the watersheds that are influenced by snowpack experience peak streamflow volume in June. During the 60 years between 1948 and 2008, the annual percentage of streamflow that occurs in June has decreased in northern Idaho watersheds by 1-15%[8]. This shift indicates that snowmelt is occurring earlier, that the amount of snowmelt is reduced and, as a result, there is less streamflow during summer. Projections also indicate reduced future winter (December-February) snowpack in Idaho, particularly at lower elevations, with more reductions associated with greater warming in later years[3]. As a result, summer streamflows near Moscow are projected to decrease by 20-40% by the 2040s under a moderate greenhouse gas emissions scenario[8].

Reduced snowpack can have consequences for fire season, agriculture, and winter recreation. For example, the length of the ski season in northern Idaho is projected to decrease by 50% or more by 2050[10].



“Hello Walk”, University of Idaho, by Kristin Haltinner, 2019

Streamflows in northern Idaho have decreased since the mid-1900s, and summer streamflows are expected to decrease 20-40% by the 2040s.

Snake River, by Kristin Haltinner 2016

Soil Moisture

Despite projections of increased precipitation in the winter, spring, and fall, summer soil moisture is expected to decrease[3] and annual water deficit (an indicator of plant stress) is expected to increase (Figure 12)[11] as a result of decreased summer precipitation and increased evaporation rates associated with higher projected temperatures. These increasingly drier conditions will have impacts on agriculture and fire seasons.

Water Quantity and Quality

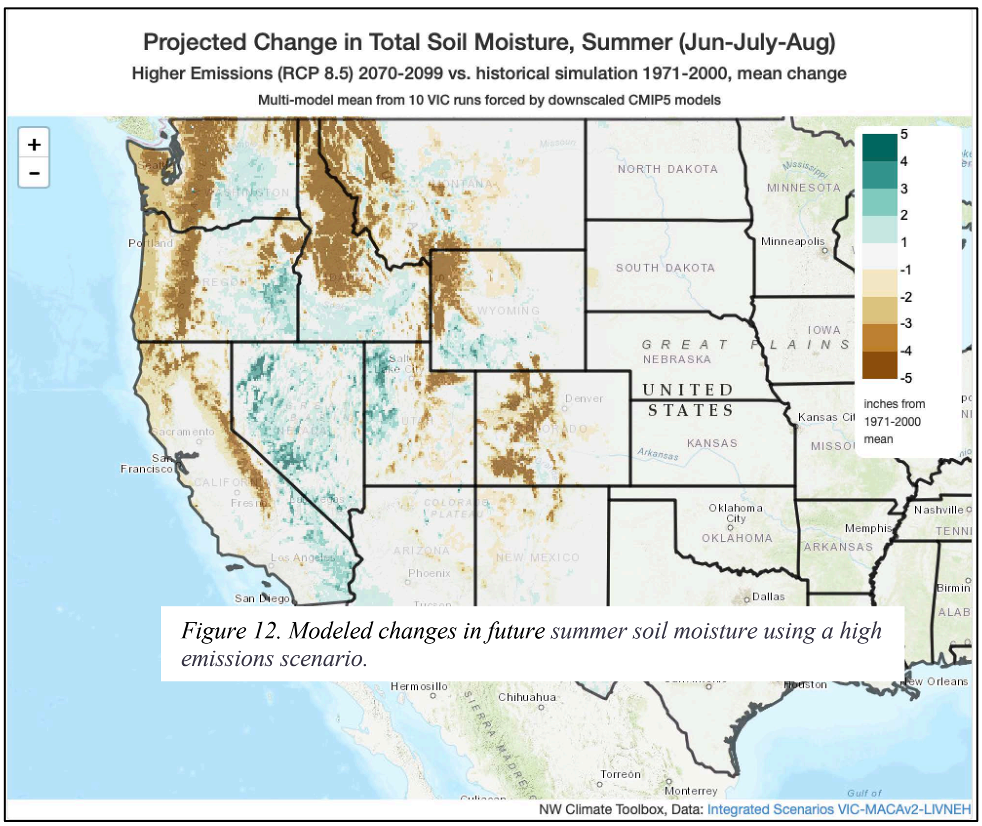


Figure 12. Modeled changes in future summer soil moisture using a high emissions scenario.

As described above, observations and projections indicate reductions in snowpack amount, timing of spring runoff, and streamflow throughout the year. These alterations indicate the likelihood of significant impacts to fisheries and aquatic ecosystems, dam operations, hydropower, and farm irrigation. In addition, lower summer water flows and higher air temperatures will increase summer water temperature, and higher air temperatures will increase water temperature in lakes and streams. The last 50 years have brought a 1.5 ºF increase in water temperature for the North Fork of the Clearwater River[9]. Higher water temperature affects freshwater ecosystems, including fish, and increases the potential for harmful algae blooms[12].

Wildfires

Over the past 30 years the western US has experienced a warming and drying climate that has led to a greater prevalence of dry fuel for forest fires and subsequent increase in area burned[13]. In the past 25 years, Idaho fire seasons have lengthened by 47 days[9].

The annual area burned is expected to increase by a factor of 10 by 2050.

The number of large fires has also increased in recent years. Across the Rocky Mountains, the number of large fires between 1984 and 2011 rose from less than 20 fires per year in the 1980s to more than 40 per year in the 2000s[3]. However, there was substantial variability from year to year.

Future projections indicate that forest fires will continue to increase throughout Idaho, including near Moscow. The annual area burned is expected to increase by a factor of 10 by 2050 (using a moderate greenhouse gas emissions scenario) with additional increases by 2100[14]. For Moscow, the number of extreme fire danger days is projected to double by 2050 from 11 to 22 (under the high emissions scenario; Figure 13)[4]. Increasing fire frequency and size will have significant negative impacts on the community. We will face additional losses related to infrastructure (structural damage), injury and deaths due to fire, the effects of reduced air quality from smoke on human health, economic costs of fire suppression, recreational land closures because of higher fire risk, and soil degradation and siltation of streams after burns.

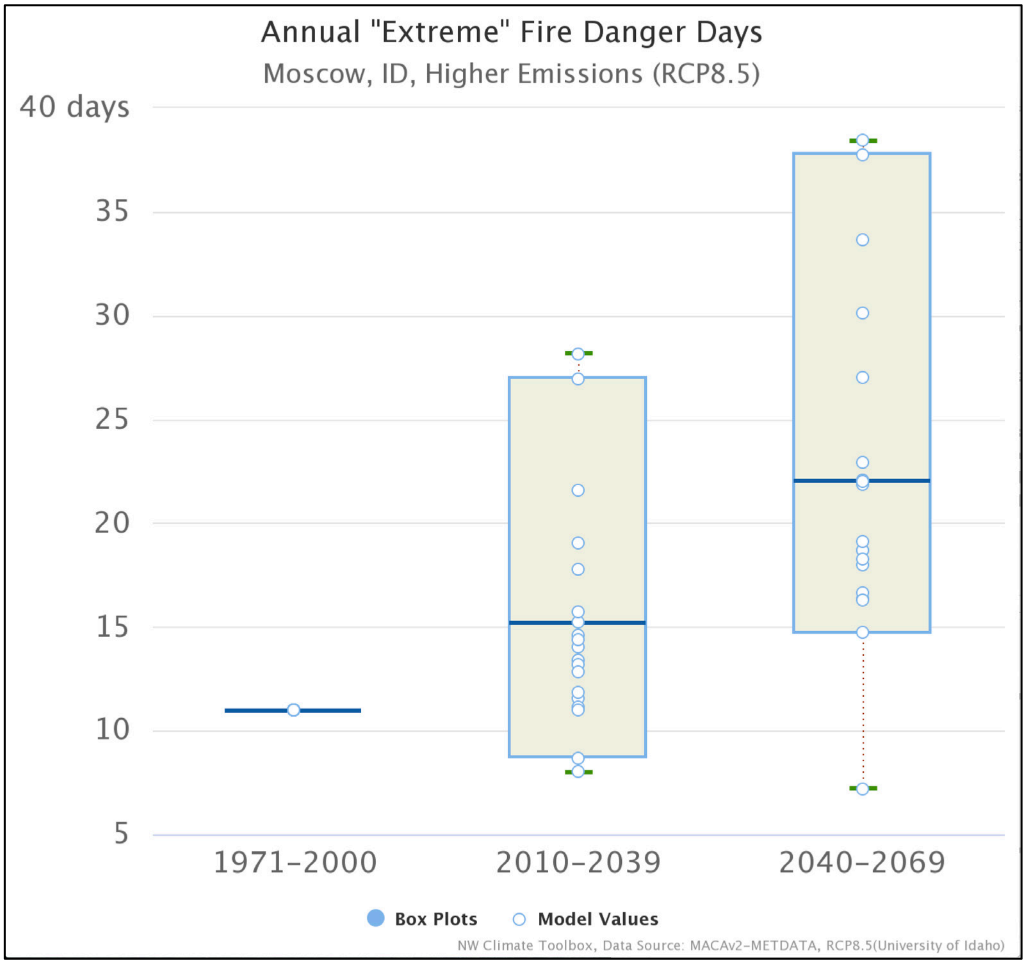


Figure 13. Modeled changes in future number of days with extreme fire danger using a high emissions scenario. See Figure 2 for more details about box plots.

Public Health

Climate change is expected to have profound impacts on public health.

First, the increase in wildfire activity is expected to cause a decrease in air quality. Decreased air quality is correlated with a rise in respiratory and cardiovascular illnesses[15]. Respiratory problems are also likely to increase as a result of increased ozone and pollen[8]. People with asthma or weakened immune systems, the very young, the very old, and those who lack health care are at greater risk of negative effects of poor air quality and therefore these impacts of climate change[15].

Second, the rising temperatures in the summer and increase in heat waves are likely to cause a rise in hyperthermia (overheating) and heat-related deaths throughout the region[8]. High air temperature is also correlated with cardiovascular illnesses, respiratory illnesses, kidney function, mental health, and premature childbirth[16]. These problems are exacerbated in the very young and the very old.

Projected warming is expected to lead to a reduction in cold-related mortality in Idaho that may outweigh the increase in heat-related deaths, possibly resulting in a reduction in overall climate-related human mortality[17]. However, this conclusion is subject to some uncertainty because of confounding factors such as humidity and air quality as well as inconsistent and underreported experiences with both hyperthermia and hypothermia[16].

Third, the rising water temperatures resulting from increased temperature and earlier snowmelt are expected to lead to an increase in water-borne illnesses. Two such illnesses of local concern are caused by *Cryptosporidium* and *Giardia*[18]. Surface water for human consumption is at risk for contamination as a result of pathogens or toxic algae blooms[18].

Fourth, vector-borne illnesses are expected to spread across the region as conditions warm, affecting the range and seasonal activity of insects, such as ticks, and other vectors[19]. The number of days that it is warm enough for disease carrying mosquitoes to survive, termed "disease danger days," increased from 113 to 126 in the Lewiston area between 1970 and 2017[20]. West Nile virus occurs in Idaho[21], and projections indicate an increased probability of the virus occurring as temperatures increase[22]. Studies of the responses of such diseases to increasing temperatures are unavailable for Moscow.

Local child at Moscow's Rural Fire Station by Kristin Haltinner, 2017

Agriculture and Food

Multiple impacts of climate change to agriculture could occur; however, detailed scientific understanding is currently incomplete. Generally, the impact on wheat farming is expected to be positive, with an increase in wheat yields projected as a result of CO_2 fertilization and warmer temperatures[17,23,24]. Yield increases are expected to plateau or yields to decline by the end of the century, depending on scenario and location[24]. For other crops, the impact of warmer temperatures and decreased soil water is likely to decrease growth[25]. Climate change will also lead to a change in the best locations for crops to grow. For example, higher temperatures may lead to an expanded area of conditions suitable for growing perennial crops such as almonds[26]. Carbon dioxide fertilization may lead to lower nutritional value for some crops important for human food[27].

Insects, pathogens, and weed pests may increase in response to climate change, thereby offsetting some projected yield increases[24].

Climate change is also projected to impact livestock. Domestic animal foraging may increase because of a longer grazing season and shorter period of winter feeding of animals[28,29]. However, hotter summers are expected to lead to greater heat stress of livestock, which reduces productivity[30].

Higher temperatures and precipitation changes will also impact local fish populations and fisheries. As temperatures rise, fish become stressed, leading to fish die-offs or poor migratory returns, which may impact recreational fishing and related tourism in the region.

Experience of Local Farmers by Ian Clark

As dryland farmers, we gamble on future favorable weather every time we put a crop in the ground.

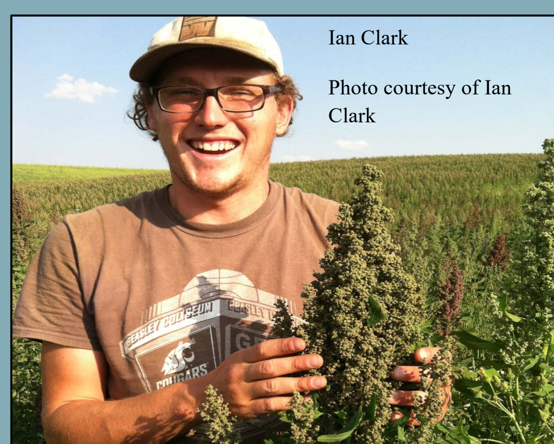
Here in the Palouse, we have been very fortunate to live in a relatively stable climate which has been excellent for producing grains, legumes and other crops. Climate change threatens this stability and the crops that depend on it.

An increase in unstable and volatile weather (which is predicted for this area) has the potential to devastate the current farm economy as we know it. Extreme weather events such as drought, flooding, temperature swings, heat, or hail can ruin a crop overnight.

Winter wheat, the backbone of dryland PNW ag, takes over 10 months from seeding to harvest. This means that for over 80% of the year our wheat is susceptible to extreme weather.

Adaptation and resilience is a necessity as things are always changing but climate change has the potential to strain local farmers past what they are capable of.

The existence of a changing climate is not what we should be asking in agriculture, it is are we ready, willing, and able to adapt quick enough to continue to make a living farming on the Palouse.

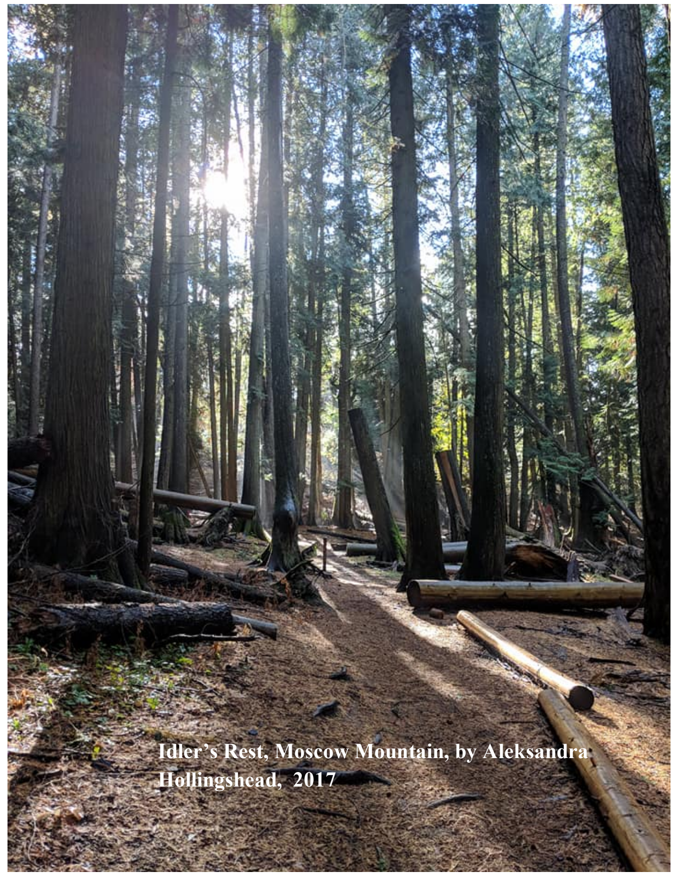


Ian Clark

Photo courtesy of Ian Clark

Forestry

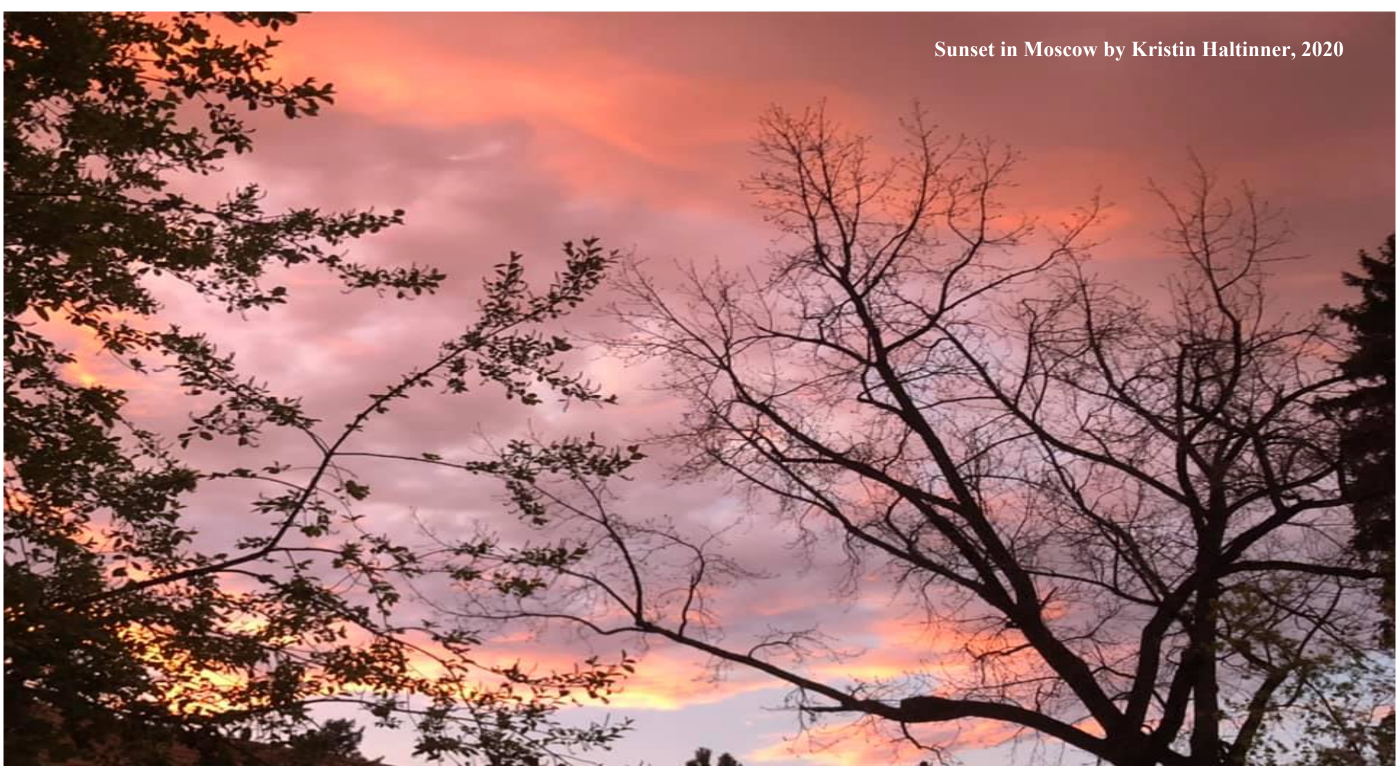
Idaho has 20.5 million acres of federally designated forest land, covering about 40% of the state[31]. Climate change is expected to impact forests in our region. Tree species that have adapted to lower-elevation and moisture-limited landscapes, such as Douglas-fir or ponderosa pine, will be stressed more by warming[32]. Higher-elevation spruce and larch may be eliminated from many landscapes as conditions become too warm or dry[33]. Forests are also threatened by an increasing likelihood of forest fires.



Idler's Rest, Moscow Mountain, by Aleksandra Hollingshead, 2017

Forests are also expected to be impacted by an increase in insects and pathogens. Tree mortality from bark beetles has already resulted in a loss of 1.5 million acres of trees in the last several decades[34]. Bark beetles thrive in warmer, drier climates as do some forest pathogens[35-38], and as a result, bark beetle outbreaks are expected to increase with warming[35].

As a result of a changing climate, Idaho is likely to experience shifts to non-forest vegetation types (e.g., shrublands) where hotter, drier conditions can no longer support forest vegetation[33]. Projections also indicate that southern Idaho will see the expansion of deserts and the northern part of the state may experience the loss of forests[33].



Sunset in Moscow by Kristin Haltinner, 2020

Economic Impacts

Economic impacts of climate change are difficult to predict. The results presented here are incomplete and subject to some uncertainty. A forthcoming report by the University of Idaho McClure Center will describe the economic impacts of climate change throughout Idaho in greater detail[39].

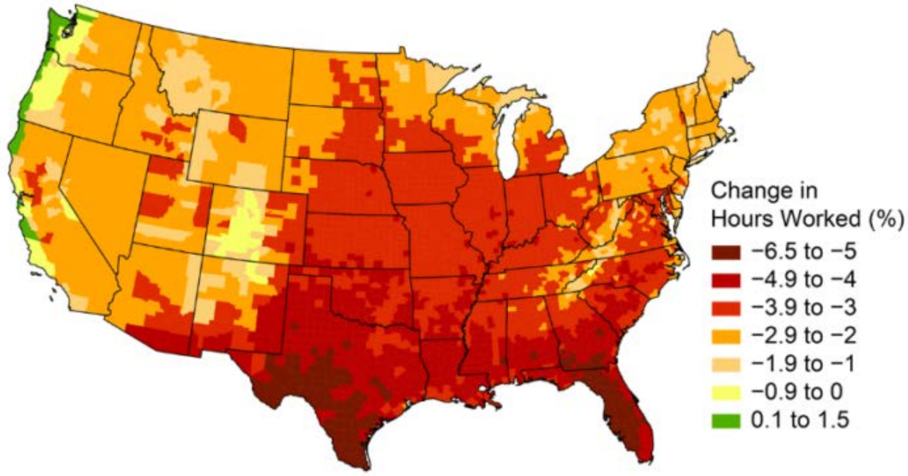


Figure 15. Percent change in hours worked in 2090 in response to projected warming using a higher emissions scenarion (RPC8.5) for high-risk industries only (which are defined as agriculture, forestry, and fishing; hunting, mining, and construction; manufacturing, transportation, and utilities). Source: USGCRP, 2018.

Overall, climate change is expected to have a negative impact on global and US economies. Increased costs are projected to cover damaged infrastructure, property loss, loss of work/labor (Figure 15), and community vitality. Because Idaho's economy relies on natural resources (Figure 16), job loss and financial loss from sales may impact the state. Additionally, costs associated with meeting increased energy demands (i.e., cooling), wildfires, and public health crises will impact local communities[25]. Crime rates may also increase[17]. Other studies suggest that costs of energy and cold-related mortality will be reduced[17].

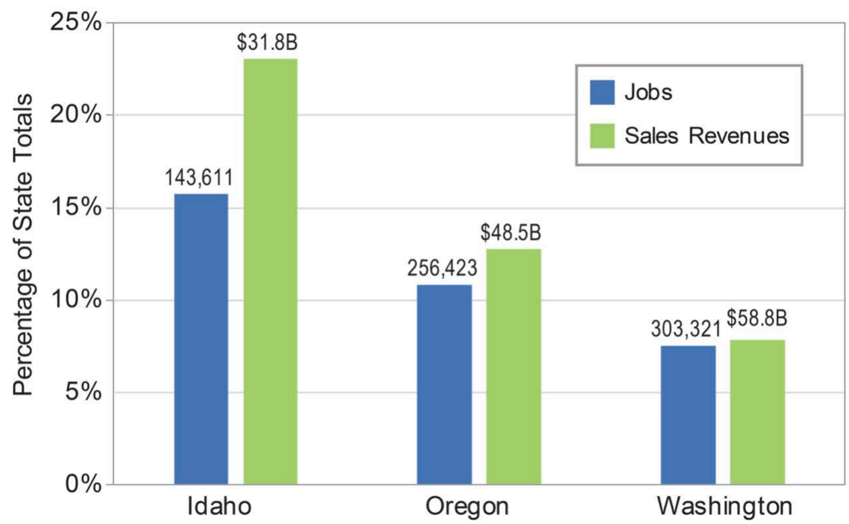


Figure 16. Natural resources are a key part of Idaho's economy. Sales for agriculture, forestry, and fisheries sectors based on 2015 data. Source: USDA Forest Service and Boise State University and USGCRP, 2018.

There is some indication that climate change will positively impact crop production in Idaho for several decades into the future[17,23,24]. However, other climate change effects including increased pests and reduced summer streamflow and irrigation[25] were not included in these studies. Warming may decrease livestock productivity[25].

Other potential expenses, for which there is little data for analysis, include replacing infrastructure as a result of destructive fires or floods, flood cleanup, and managing the waste-water system in light of regional, seasonal floods. These findings will be clarified in the McClure Center Report scheduled for release in 2021.

Additional Resources

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